Proposal Reviews

#205: Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary

University of California, Davis

Initial Selection Panel Review	
Research and Restoration Technical Panel Review	
Bay Regional Review	
Delta Regional Review	
External Scientific Review	#1 #2 #3
Environmental Compliance	
Budget	

Initial Selection Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Initial Selection Panel Review

Proposal Number: 205

Applicant Organization: University of California, Davis

Proposal Title: Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary

Please provide an overall evaluation rating.

Explanation of Recommendation Categories: Fund

- **As Is** (a proposal recommended for funding as proposed)
- **In Part** (a proposal for which partial funding is recommended for selected project phases or components)
- **With Conditions** (a proposal for which funds are recommended if the applicant contractually agrees to meet the specified conditions)

Consider as Directed Action in Annual Workplan (a proposal addressing a high priority action that requires some revision followed by additional review prior to being recommended for funding)
Not Recommended (a proposal not currently recommended for funding-after revision may be considered in the future)

Note on "Amount":

For proposals recommended as Fund As Is, Fund In Part or Fund With Conditions, the dollar amount is the amount recommended by the Selection Panel.

For proposals recommended as Consider as Directed Action in Annual Workplan, the dollar amount is the amount requested by the applicant(s).

Fund	
As Is	**-**
In Part	**-**
With Conditions	**-**
Consider as Directed Action	**X**
Not Recommended	**-**

Amount: **$152,272.00**

Conditions, if any, of approval (if there are no conditions, please put "None"):

None

Provide a brief explanation of your rating:

This research proposal has potential to provide valuable information that can be used in control and eradication efforts for pepperweed. The studies will be conducted in the lab and in mesocosms rather than by experimental introduction in the field, satisfying some of the concerns raised in regional review. The Technical panel and the external scientific reviews raise some concerns on various aspects of the study. The Selection Panels recommendation is that the proposer revise in accordance with the comments of the external reviewers and resubmit the project for funding as a directed action.

Research and Restoration Technical Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Research and Restoration Technical Panel Review Form

Proposal Number: 205

Applicant Organization: University of California, Davis

Proposal Title: Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary

Review:

Please provide an overall evaluation summary rating:

Superior: outstanding in all respects;
Above Average: Quality proposal, medium or high regional value, and no significant administrative concerns;
Adequate: No serious deficiencies, no significant regional impediments, and no significant administrative concerns;
Not Recommended: Serious deficiencies, significant regional impediments or significant administrative concerns.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Superior	**The proposed study is likely to provide very useful and pertinent information concerning some of the factors that influence the invasion of marshes by L. latifolium. Some important factors such as dispersal dynamics are omitted, however. This would not affect the overall excellent quality of the proposal were it not for the fact that in some cases these omissions are directly pertinent to some of the stated goals of the project, and they complicate practical interpretation of the proposed results. The negative regional reviews are not necessarily reflective of the proposals potential.**
XAbove average	
-Adequate	
-Not recommended	

1. **Goals and Justification.** Does the proposal present a clear statement of goals, objectives and hypotheses? Does the proposal present a clear justification and conceptual model for the project?

   The goal of the proposed project is clear: to determine the factors influencing the establishment of Lepidium latifolium in the wetland landscape. The information the project will generate has a clear and immediate practical use in developing general risk assessments for the spread of L. latifolium and in designing specific control strategies to prevent its establishment in newly restored wetlands. An insightful aspect of the proposed study is an explicit recognition that the factors influencing L. latifolium invasive success involve an interaction between the characteristics of both L. latifolium and of the target wetland. This concept is an important one, and it should be incorporated as part of any predictive management strategy. The specific hypotheses to be tested in the proposed project are consistent with this framework. The author provides a clear conceptual model for the main factors potentially influencing the invasion success of L. latifolium, although the author cites

very little previous work from which this model is derived. The existence of a mathematical model derived from the conceptual model is mentioned, but never described. This would be instrumental in coordinating the interpretation of the study. The proposed work does attempt to fill in the evidentiary gaps in the conceptual model: 1)The CCA analysis will provide evidence that L. latifolium distribution in a marsh is related to key environmental variables. 2) How L. latifolium and environmental characteristics interact to influence invasibility will be tested in the lab experiments. 3) The implications of such interactions to actual marshes and restoration projects will be investigated using mesocosms.

2. **Likelihood of Success (Approach, Feasibility, Capabilities and Performance Measures).** Is the project likely to succeed based on the approach, feasibility and project team capabilities? Are the proposed performance measures adequate for measuring the project's success?

   The proposed study is generally well designed and the methods are appropriate for meeting most of the specific objectives of the project. The study has several methodological limitations, however, which may decrease the ease with which its results can be used to generate accurate predictors of invasion risk eg. What is the relative contribution of different reproductive life history strategies or seed dispersal to invasibility?; in plant communities order of arrival is important, but not addressed; the details of the mesocosm experiement are sketchy; potential competitive displacement may not be estimated well by single-species pot experiments. The approach is generally well documented by the author. The design is standard and suitable for the questions asked, and it is likely to produce meaningful results in the time frame outlined in the proposal.

3. **Outcomes and Products.** Will the project advance the state of scientific knowledge in general and/or make an important contribution to the state of knowledge of the Bay-Delta Watershed? For restoration proposals, is the project likely to contribute to ecosystem restoration or species recoveries in a significant way? Will the project produce products useful to decision-makers and scientists?

   Two valuable products will likely emerge from the proposed study: 1) a picture of how the current distribution of L. latifolium and other non native plants is related to environmentaproperties within marshes. 2) a detailed model of how L. latifolium establishment success from seed and its subsequent growth is influenced by salinity and Scirpus cover. This information will be immediately useful, incorporated into management and control programs, and it will form an important knowledge base for future studies. These proeduct, in themselves, however, are not sufficient to inform a comprehensive plan to manage L. latifolium invasion dynamics or the invasibility of restored wetlands. The proposed study does not investigate how wetland invasibility is altered by patterns of propagule flow. This question has practical implications. For example, how large of a L. latifolium free buffer zone is needed to ensure that a restored marsh is at low risk for invasion? Is this buffer zone more important than the specific salinity or vegetation characteristics of the marsh in preventing L. latifolium establishment?

4. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   Extremely reasonable.

5. **Regional Review.** How did the regional panel(s) rank the proposal (High, Medium, Low)? Did the regional panel(s) identify significant benefits (regional priorities, linkages with other activities, local involvement) or impediments (local constraints, conflicts with other activities, lack of local involvement) to this proposal? What were they?

Bay Regional Review ranked the proposal Low. There is perhaps a misunderstanding regarding the panels understanding of the field aspect of this proposed research. The great majority of the work is to be done in greenhouses and mesocosms -not in actual marshes as the author does not wish to introduce the plant to field sites. Field verification would come, if at all, in natural recruitment patterns. The panel also felt that invasion of tidal marshes was not relevant as impact from this species is greatest in the high tidal brackish marsh zone.

Delta Regional Review also ranked the proposal Low because the research is focused on the Suisun Marsh, rather than the Delta. Both Regional Revews noted that there is no local involvement or acknowledgement of other pepperweed researchers.

6. **Administrative Review.** Were there significant concerns about the proposal with regard to the prior performance, environmental compliance and budget administrative reviews? What were they?

   No.

Miscellaneous comments:

None

Bay Regional Review:

Proposal Number: 205

Applicant Organization: University of California, Davis

Proposal Title: Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary

Overall Ranking: **X**Low **-**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

The proposal does not meet any of the panel's criteria.

1. Is the project feasible based on local constraints?

   -Yes **X**No

   How?

   The proposal appears to involve manipulation of relatively intact tidal marshes with significant natural resource values. Due to problems with research-induced impacts to some sensitive tidal marshes in the recent past, DFG staff have expressed substantial doubt about the feasibility of permission to perform the type of work described in the areas proposed.

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   -Yes **X**No

   How?

   Although the subject of perennial pepperweed invasion is indeed a high priority for restoration in the Bay-Delta region, the focus of this proposal is inexplicably placed on invasibility of intact tidal marshes (a feature to protect, not manipulate to control invasive species) and on plant interactions in the lower middle marshplain, between pepperweed and Scirpus spp.; it dismisses the significance of pepperweed in the high tidal brackish marsh zone, where its spread is actually greatest, and its impacts on at-risk species is greatest. The relevance of the study is weak.

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   -Yes **X**No

   How?

   The proposal evidently failed to interpret the regional significance and emphasis on impacts of perennial pepperweed in the high marsh zone, and it does not identify substantial partnerships or explicit cooperation with specific marsh managers or owners with severe

existing conflicts between pepperweed and at-risk species. It is not linked with any herbicide control methods, which are the principal existing feasible tools currently available to manage this species.

4. Does the project adequately involve local people and institutions?

   -Yes **X**No

   How?

   The proposal does not identify substantial partnerships or explicit cooperation with specific marsh managers or owners with severe existing conflicts between pepperweed and at-risk species.

   Other comments: The proposal does not make a credible case that the basic demographic/life-history research will be likely to translate into practical control strategies: there is no indication that meaningful Ademographic weaknesses@ in fact exist, or are likely to exist in this highly successful invader which has already expanded over most of its potential range in the estuary. In short, the proposal appears largely academic and lacks sufficient regionally specific background research or field observation on the ecology of perennial pepperweed in the Bay-Delta region. It makes unfortunately inaccurate assumptions about the character of the invasion in tidal marshes. The erroneous assumption that interactions with Scirpus, rather than the high marsh, is a research priority justifies doubt of the general rigor of the proposal=s preparation, despite adequate general methodology.

Other Comments:

x

Delta Regional Review:

Proposal Number: 205

Proposal Title: Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary

Overall Ranking: **X**Low **-**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

Because this proposed research is targetted towards Suisun marsh, ratherthan the Delta, is is a low priority for the panel.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   work on local public area

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   XYes **-**No

   How?

   goals 1 restore habitat corridors), 2 restore + rehabilitate floodplains), 4 restore habitat that would benefit at-risk species), and 5 (control NIS)

   invasive species research

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   XYes **-**No

   How?

   native habitat improvements and restoration

4. Does the project adequately involve local people and institutions?

   -Yes **X**No

   How?

no linkage or acknowledgement of other efforts looking at pepperweed

Other Comments:

could provide some valuable information on pepperweed but should be coordinated with other programs

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **205**

Applicant Organization: **University of California, Davis**

Proposal Title: **Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

I am a researcher at UC Davis, in another department from Dr. Foin, he was my instructor for 2 graduate courses 9 years ago, and we co-authored a paper.

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
XExcellent	**The proposed research combines intelligent experimental designs in a cohesive project that will result in a mechanistic understanding of Lepidium invasion. This project should be funded.**
-Good	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   Perennial pepperweed is a highly invasive, noxious weed that invades riparian corridors. The proposed research is needed to determine the abiotic conditions that promote the invasion, and the interactions with native species that fail to prevent the invasion. These are timely and important questions.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

This study is well justified - mechanistic knowledge of invasion dynamics is lacking, and this research will tease apart various proposed interacting factors to get at that vital understanding.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   A particularly strong aspect of this proposal is the cohesion and integration of the component experimental objectives - with each sub-task individually being well designed.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   The proposed research is fully documented and feasible.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   Few details are provided.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   The very valuable ability to predict and prevent Lepidium spread through an understanding of its vulnerabilities is the chief potential product from this research.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   Dr. Foin has extensive experience with marsh plants and ecosystem, and with summarizing understanding through modeling. He is well qualified to supervise this project, UC Davis will provide support.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The budget is quite modest for the amount of good information that will result from this research.

Miscellaneous comments:

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **205**

Applicant Organization: **University of California, Davis**

Proposal Title: **Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

I am an post graduate researcher in the Department of Environmental Science and Policy, University of California, Davis

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**The proposed study is likely to provide very useful and pertinent information concerning some of the factors that influence the invasion of marshes by L. latifolium. Some important factors such as dispersal dynamics are omitted, however. This would not affect the overall excellent quality of the proposal where it not for the fact that in some cases these omissions are directly pertinent to some of the stated goals of the project, and they complicate practical interpretation of the proposed results. My overall "good" should be interpreted as only slightly removed from excellent: a "good+".**
XGood	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The goal of the proposed project is clear: to determine the factors influencing the establishment of Lepidium latifolium in the wetland landscape. The information the project will generate has a clear and immediate practical use in developing general risk assessments for the spread of L. latifolium and in designing specific control strategies to prevent its establishment in newly restored wetlands. An insightful aspect of the proposed study is an

explicit recognition that the factors influencing L. latifolium invasive success involve an interaction between the characteristics of both L. latifolium and of the target wetland. This concept is an important one, and it should be incorporated as part of any predictive management strategy. The specific hypotheses to be tested in the proposed project are consistent with this framework.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   Although L. latifolium undoubtedly poses a serious threat to San Francisco Bay and Delta wetlands, the extent and degree to which it does is surprisingly poorly documented in the literature. The author makes the claim that L. latifolium poses a threat comparable to that posed by invasive hybrid Spartina genotypes, but published evidence supporting this claim is scant for L. latifolium compared to that available for Spartina. Given the strength of the circumstantial evidence that L. latifolium poses a significant threat, such a criticism is a quibble. It does highlight, however, that very little is known about the dynamics of L. latifolium invasion in the brackish systems of the San Francisco Estuary. Such a lack of information certainly justifies the proposed study, but it also makes the project's stated goal a more difficult one to achieve. I discuss this in more detail below and in section three.

   The author provides a clear conceptual model for the main factors potentially influencing the invasion success of L. latifolium, although the author cites very little previous work from which this model is derived. The proposed work does attempt to fill in the evidentiary gaps in the conceptual model: 1)The CCA analysis will provide evidence that L. latifolium distribution in a marsh is related to key environmental variables. 2) How L. latifolium and environmental characteristics interact to influence invasibility will be tested in the lab experiments. 3) The implications of such interactions to actual marshes and restoration projects will be investigated using mesocosms.

   While comprehensive within the framework of the conceptual model, given the scant amount of previous literature it is hard to evaluate whether the conceptual model includes all, or even the most important, of the factors potentially influencing L. latifolium invasive success. For example, the author makes the claim that dispersal either by rhizomes or seed is not a major limiting factor on L. latifolium invasibility. However, the author provides no evidence to support this claim besides the fact that seeds are "numerous and readily dispersed", neither of which is sufficient evidence to discount the importance that propagule supply might play in L. latifolium invasion dynamics. While this does not discount the justification for the proposed study, it does have implications for how thoroughly the study can meet its broad goal. I discuss this specifically below.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   The proposed study is generally well designed and the methods are appropriate for meeting most of the specific objectives of the project. The information concerning the distribution of L. latifolium in relation to environmental variables and the establishment success of L. latifolium relative to salinity, inundation, and native cover will greatly add to our poor knowledge of the factors influencing invasion of wetlands by L. latifolium. The study has several methodological limitations, however, which may decrease the ease with which its results can be used to generate

accurate predictors of invasion risk.

A) The author states as a specific objective "to determine the combination of reproductive life history strategies and environmental characteristics that are associated with Lepidium latifolium invasibility (P. 3) and lists "Seed dispersal and early growth" as a section heading (P. 5), but the relative contribution of different reproductive life history strategies or of seed dispersal to invasibility will not be a product of the proposed work. For example, the relative contribution of seeds or rhizomes to the pool of potentially invasive propagules will not be measured. This omission does not invalidate the usefulness of the anticipated results: establishment success relative to salinity and Scirpus cover is valuable information. However, practical interpretation of the results will have to be evaluated in light of what is still unknown. For example, establishment dynamics of rhizomes with respect to salinity and Scirpus cover may be very different from that of seed. This could have important management implications if most invasive establishment is actually by rhizomes, not seed.

B) In the early growth laboratory experiment it is unclear whether the author proposes to sow L. latifolium seeds into plots composed of pure stands of the three Scirpus species, mixed plots, or a combination. It is possible that the "resistance" of native wetland plots to L. latifolium invasion could be influenced by the specific species combination of plots. Evidence of this exists for some grassland species (Callaway and Aschehoug , Science v290).

C) Similarly, in the experiment testing the "potential for competitive displacement" of Scirpus sp. by L. latifolium, the author proposes to compare the relative growth of species grown in separate growth pots. This is not a valid test of even "potential" competitive displacement. Many ruderal species, for example, display markedly higher growth rates when grown alone, but are easily out competed by competitive dominants when grown in mixtures. Besides not being a direct test of competitive influence, interactions between species could likely play an important role in competitive displacement. Such potential species interactions could have important management implications. For example, should restored wetlands be planted in monocultures or mixed stands of Scirpus to resist invasion by L. latifolium?

D) The design of the mesocosm experiment is poorly documented. How are the mesocosms generally constructed? How big are they? Are they constructed outside or inside? Will L. latifolium seeds or seedlings be sown into them? It is difficult to evaluate how useful the mesocosms will be as practical validations without this information.

E) The lack of consideration of propagule dynamics could influence the results of the proposed field validation plots. The author does not indicate how the field validation plots will be situated with respect to the flow of L. latifolium propagules. Any differences in invasibility among the stands could be caused by differences in propagule supply. Success of the different stands in deterring L. latifolium invasion can only be interpretable with respect to knowledge of the propagule pressure each stand experiences.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

The approach is generally well documented by the author, although there are a few pertinent ambiguities which I discuss above (section 3). The design is standard and suitable for the questions asked, and it is likely to produce meaningful results in the time frame outlined in the proposal. As I discuss in section three the proposed study does not fully address all of the factors that could influence the "invasion dynamics of perennial pepperweed" or "their consequences for protection of natural and restored wetlands in the San Francisco Estuary".

This does not detrimentally affect the feasibility of attaining most of the specific objectives of the proposal (although see my comments in section three).

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   The proposal outlines clear and logical criteria with which to test the hypotheses subsumed within the project's specific objectives. Interpretation of the results with regard to the mesocosm validation experiment, however, are clouded by the conceptual omissions of the study. See my discussion in section 3a.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   Two valuable products will likely emerge from the proposed study: 1) a picture of how the current distribution of L. latifolium and other non native plants is related to environmental properties within marshes. 2) a detailed model of how L. latifolium establishment success from seed and its subsequent growth is influenced by salinity and Scirpus cover. This information will be immediately useful, incorporated into management and control programs, and it will form an important knowledge base for future studies.

   In themselves, however, they are not sufficient to inform a comprehensive plan to manage L. latifolium invasion dynamics or the invasibility of restored wetlands. For example, the author states that dispersal does not appear to be a limiting factor on L. latifolium invasibility. However, propagule pressure has been shown to be an important factor influencing the probability of establishment of alien species in a wide diversity of other systems. Even if L. latifolium seeds can be abundantly produced and widely dispersed, dispersal patterns and the density of arriving seeds can still strongly influence the probability that a local marsh will be invaded by L. latifolium. The proposed study does not investigate how wetland invasibility is altered by such patterns of propagule flow. This question has practical implications. For example, how large of a L. latifolium free buffer zone is needed to ensure that a restored marsh is at low risk for invasion? Is this buffer zone more important than the specific salinity or vegetation characteristics of the marsh in preventing L. latifolium establishment?

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   I do not have direct knowledge of the track record of the author with respect to previous projects. However, the author is a well known researcher in the field of estuarine ecology. He has a well established record of important peer-reviewed contributions in a number of areas pertinent to the current proposal.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The budget is reasonable and adequate.

Miscellaneous comments:

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **205**

Applicant Organization: **University of California, Davis**

Proposal Title: **Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

None

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
XExcellent	**Although theres a few weaknesses in the proposal, especially elucidation of the structure and role of the conceptual model in the research, this represents an extremely economical study that could provide considerable new information?**
-Good	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The objectives of the proposal are clearly elucidated, but a hypothesis structure is (surprisingly) not employed. The concept is extremely timely, especially given the increased scale and frequency of CALFED supported restoration within the region that L. latifolium can and does invade.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

The proposal is extremely well justified, with critical background information. However, their presumably well-developed conceptual model is not presented in the proposal! The scale of the project is well justified.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   Unlike other L. latifolium proposals, this one appears to well recognize the autecology and physiological aspects of pepperweed that make it both an effective invasive but also represent some limiting factors that could be useful in management. It also recognizes the need to conduct studies under controlled conditions in greenhouse/laboratory settings to minimize study impacts to natural marshes. Much of the research design is organized around a mathematical version of the Foin et al. (2000) conceptual model presented at 2000 CALFED Science Conference. Sufficient detail is provided to suggest that the applicants can achieve their objectives.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   The applicants experience should help ensure the projects feasibility. However, there are a number of contingent elements of the study design (e.g., field studies) that depend on interim results that prevent full evaluation.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   The simple performance measure is actually based on experimental outcome, rather than deadlines and products.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   Products are relatively routine: reports, participation in CALFED and other Bay-Delta science conferences and submission of manuscripts to peer-reviewed journals. One product that they may produce, a manual on minimizing L. latifolium invasion, could be extremely valuable.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   The applicants and institution are completely capable to conduct the study as proposed.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   Cost ($112,794) is an absolute bargain, if not (grossly?) underfunded?

Miscellaneous comments:

Environmental Compliance:

Proposal Number: 205

Applicant Organization: University of California, Davis

Proposal Title: Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary

1. Are the legal or regulatory issues that affect the proposal identified adequately in the proposal?

   -Yes **X**No

   If no, please explain:

   Possibly:

   Consultation with USFWS and CDFG required, to ascertain whether the field activities associated with this proposal can be included under existing permits of closely related projects.

2. Does the project's timeline and budget reflect adequate planning to address legal and regulatory issues that affect the proposal?

   XYes **-**No

   If no, please explain:

   If no environmental documentation or permitting is required under the purview of this proposed project.

3. Do the legal and regulatory issues that affect the proposal significantly impair the project's feasibility?

   -Yes **X**No

   If yes, please explain:

Other Comments:

Budget:

Proposal Number: 205

Applicant Organization: University of California, Davis

Proposal Title: Invasion dynamics of perennial pepperweed, Lepidium latifolium, and their consequences for protection of natural and restored wetlands in the San Francisco Estuary

1. Does the proposal include a detailed budget for each year of requested support?

   XYes **-**No

   If no, please explain:

2. Does the proposal include a detailed budget for each task identified?

   -Yes **X**No

   If no, please explain:

   Tasks and Objectives confused.

3. Does the proposal clearly state the type of expenses encompassed in indirect rates or overhead costs?

   XYes **-**No

   If no, please explain:

4. Are appropriate project management costs clearly identified?

   -Yes **X**No

   If no, please explain:

   Included in indirects?

5. Do the total funds requested (Form I, Question 17A) equal the combined total annual costs in the budget summary?

   -Yes **X**No

   If no, please explain (for example, are costs to be reimbursed by cost share funds included in the budget summary).

   Question 17a. = $113,793.78, and the Budget Summary = $112,793.78.

6. Does the budget justification adequately explain major expenses?

   XYes **-**No

   If no, please explain:

7. Are there other budget issues that warrant consideration?

   -Yes **X**No

   If yes, please explain:

Other Comments: